

Current conditions and trends in Elliott Bay water and sediment quality



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As part of King County CSO WQA & MS

Study Questions

Impairments

1. What are the existing and projected water quality impairments in receiving waters (water bodies) where King County CSOs discharge?
2. How do County CSOs contribute to the identified impairments?
3. How do other sources contribute to the identified impairments?

Corrective Actions

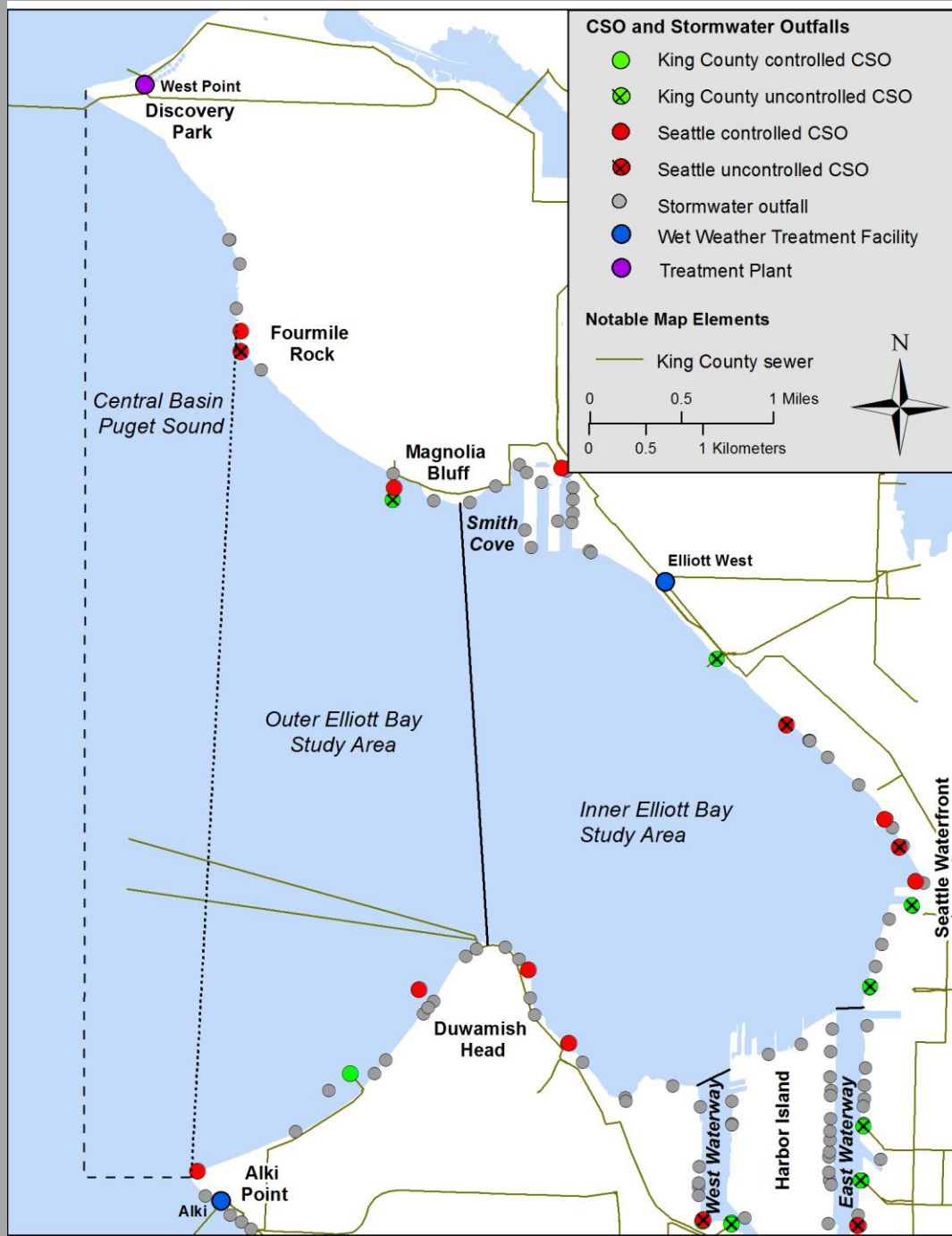
4. What activities are planned through 2030 that could affect water quality in the receiving waters?
5. How can CSO control projects and other planned or potential corrective actions be most effective in addressing the impairments?

Effective CSO Project Sequences

6. How do various alternative sequences of CSO control projects integrated with other corrective actions compare in terms of cost, schedule, and effectiveness in addressing impairments?
7. What other possible ways, such as coordinating projects with the City of Seattle and altering the design of planned CSO control projects, could make CSO control projects more effective and/or help reduce the costs to WTD and the region of completing all CSO control projects by 2030?

Elliott Bay Study Area

- Divided into 3 parts
 - Inner Elliott Bay
 - Outer Elliott Bay
 - Nearby Puget Sound waters
- Does not include East or West Waterway



Elliott Bay

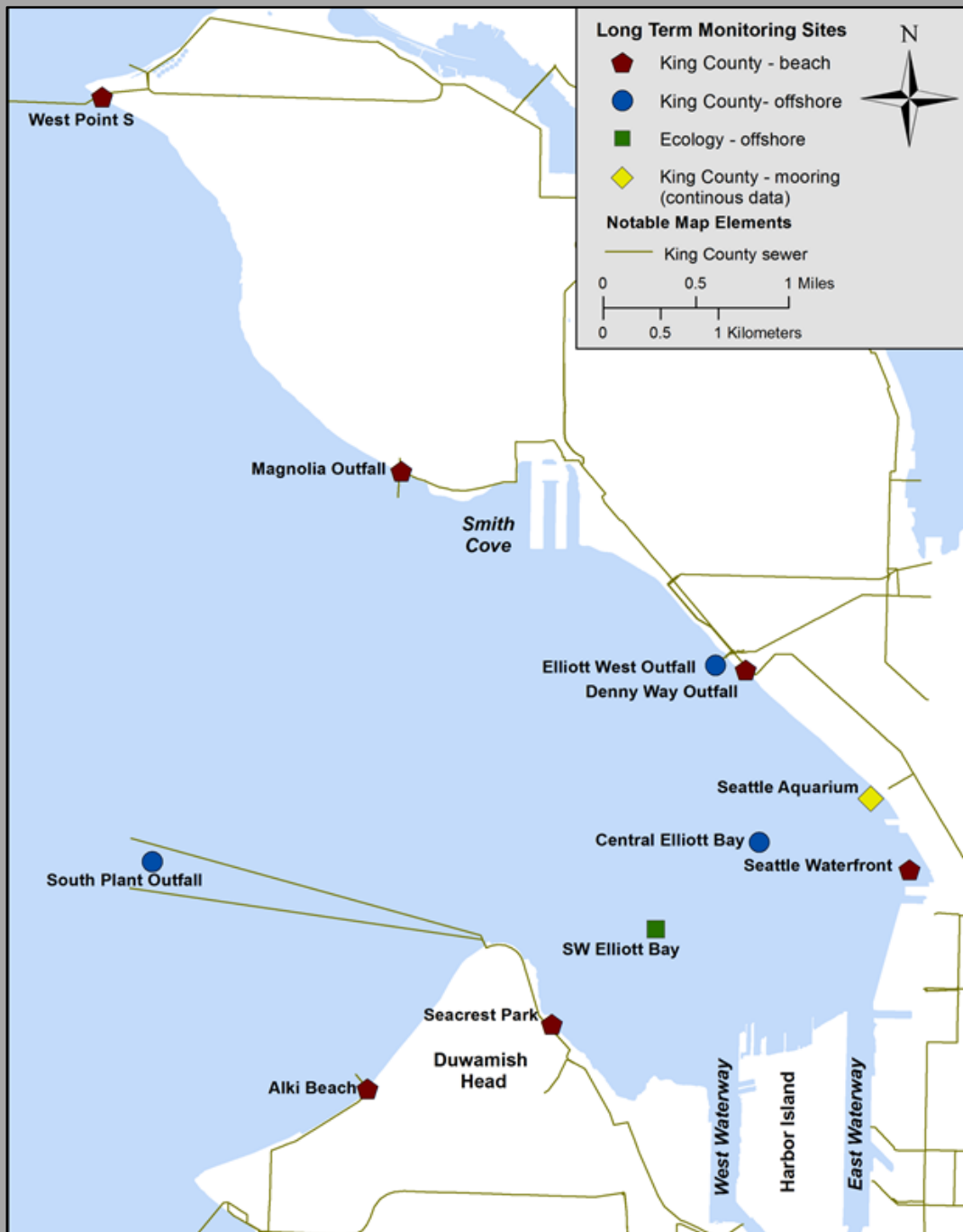
- Estuarine Bay
 - Deep (~180 m, deepest at middle of western edge)
 - Influenced by
 - Puget Sound
 - Duwamish River
- Before: complex tidal marsh
- Now: heavily modified
 - < 17% shoreline is exposed sand/mud substrate
 - Inner Bay: commerce w/ high-intensity development
 - Outer Bay: mixed land uses including some undeveloped lands
- Human Uses = fishing, boating, scuba diving, beach activities, shipping, and industry
- Many species use the bay as a nursery
 - Federally threatened and endangered species use the bay
 - Transitory pathway to the Duwamish River for salmon

Data Analyzed

Data analyzed for the report included:

- Water Quality**
- Sediment Quality**
- Benthic Invertebrate Community**
- Fish/Shellfish Tissue Data**

Water Quality Monitoring



- Monthly
- 10 sites in greater Elliott Bay in last 5 yrs
 - Offshore sites
 - Nearshore (beach) sites
- Some parameters (temp) and sites from 1970-present, most added in 1997
- Some parameters (Turbidity/TSS, Ortho-P/Total P) added or removed
- One mooring station (15 min data)

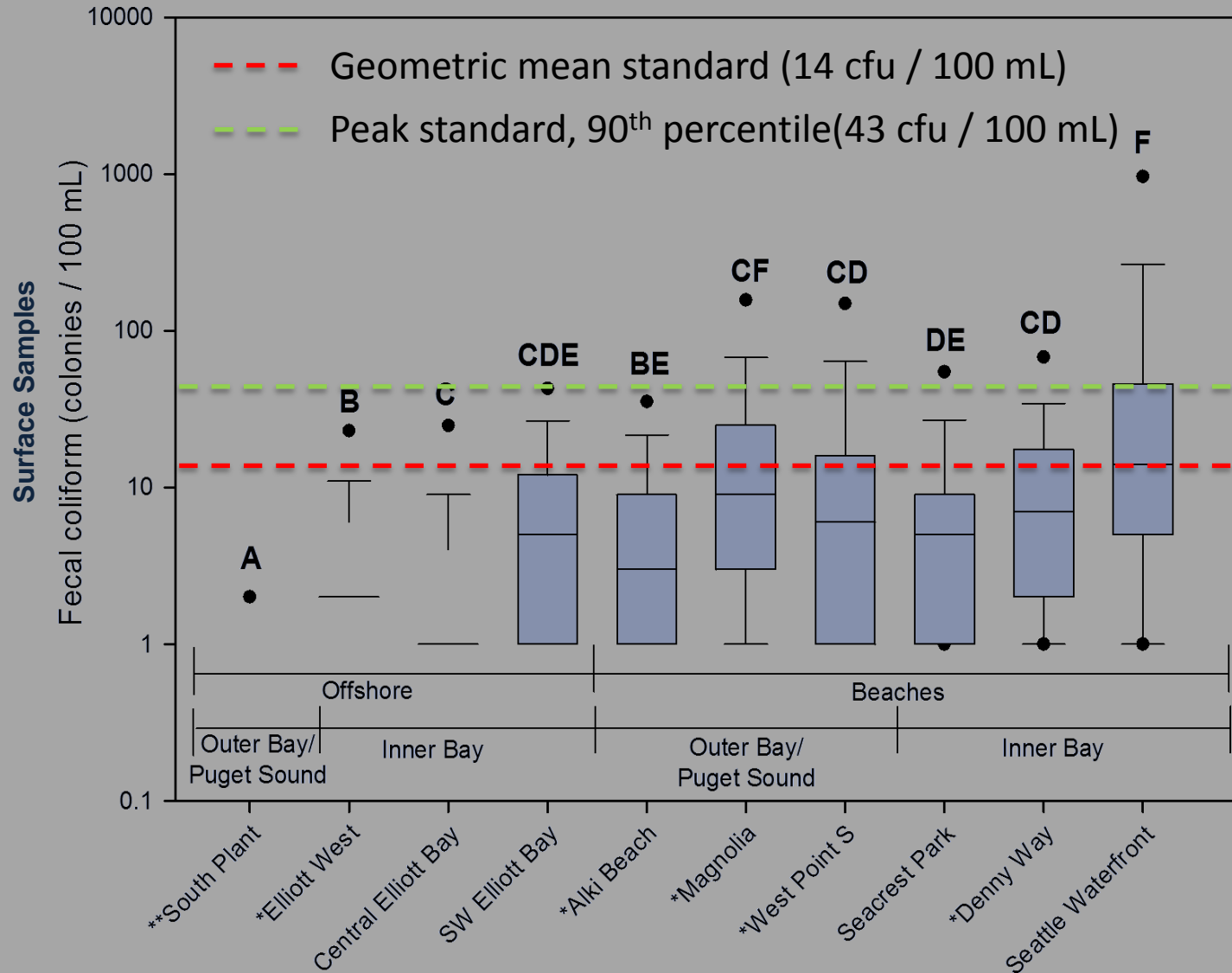
Summary: Water Quality Standards

- No violation of Ecology water quality standards for:
 - pH (limited data)
 - ammonia
 - metals or organics (organics and metals limited)
- Frequent violations of bacteria standard nearshore
- Summer surface temperature may threaten migrating salmonids
- Dissolved oxygen may be problem – deep and seasonally

Bacteria Summary

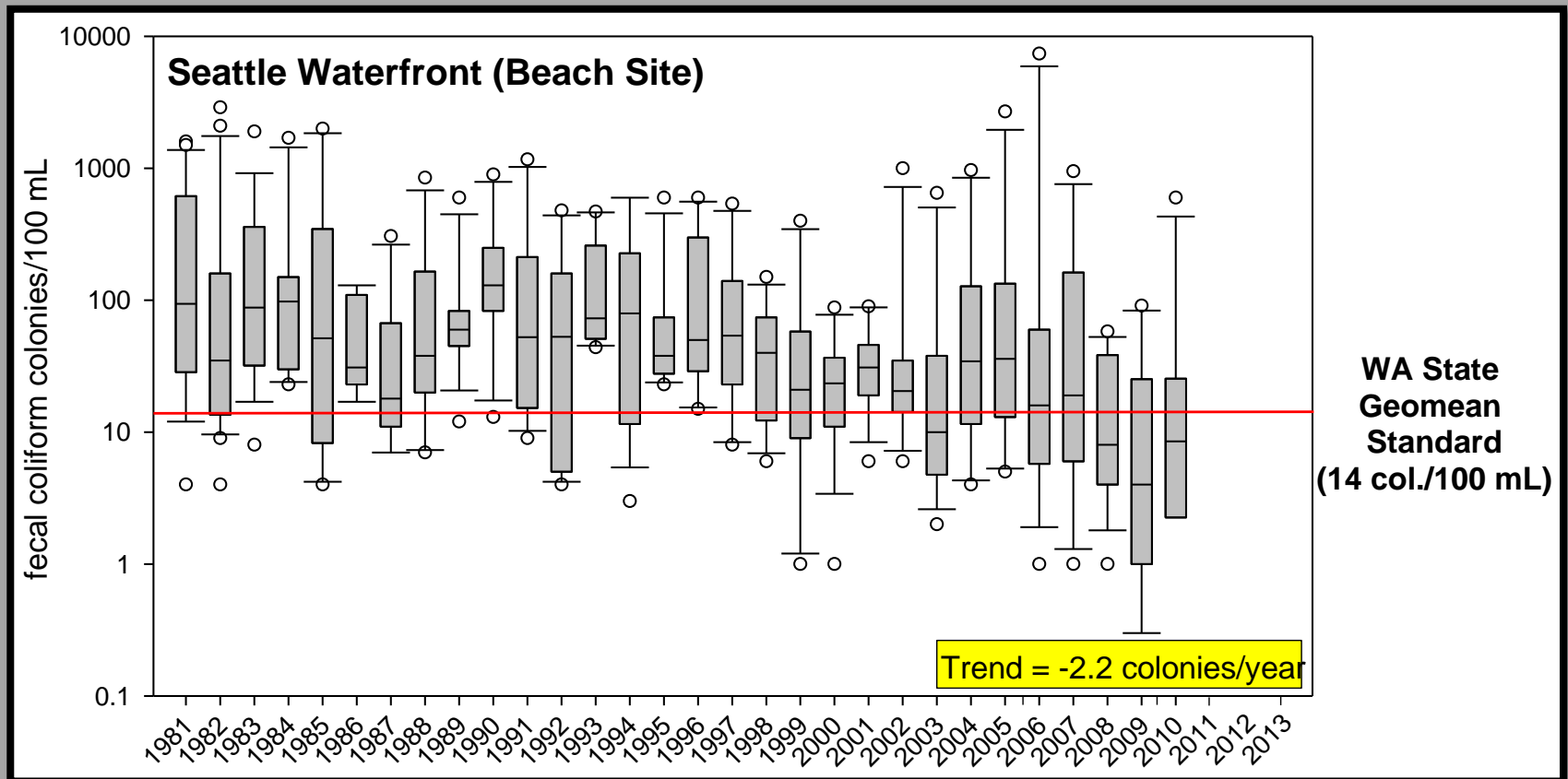
- Beach sites commonly fail water quality criteria, especially those near the waterfront
- Offshore sites rarely exceed water quality criteria, those that have are in the inner-bay
- Bacteria concentrations, on average, are highest in months with the highest rainfall
- Trends have decreased at all but one site in Elliott Bay

Water Quality: Bacteria





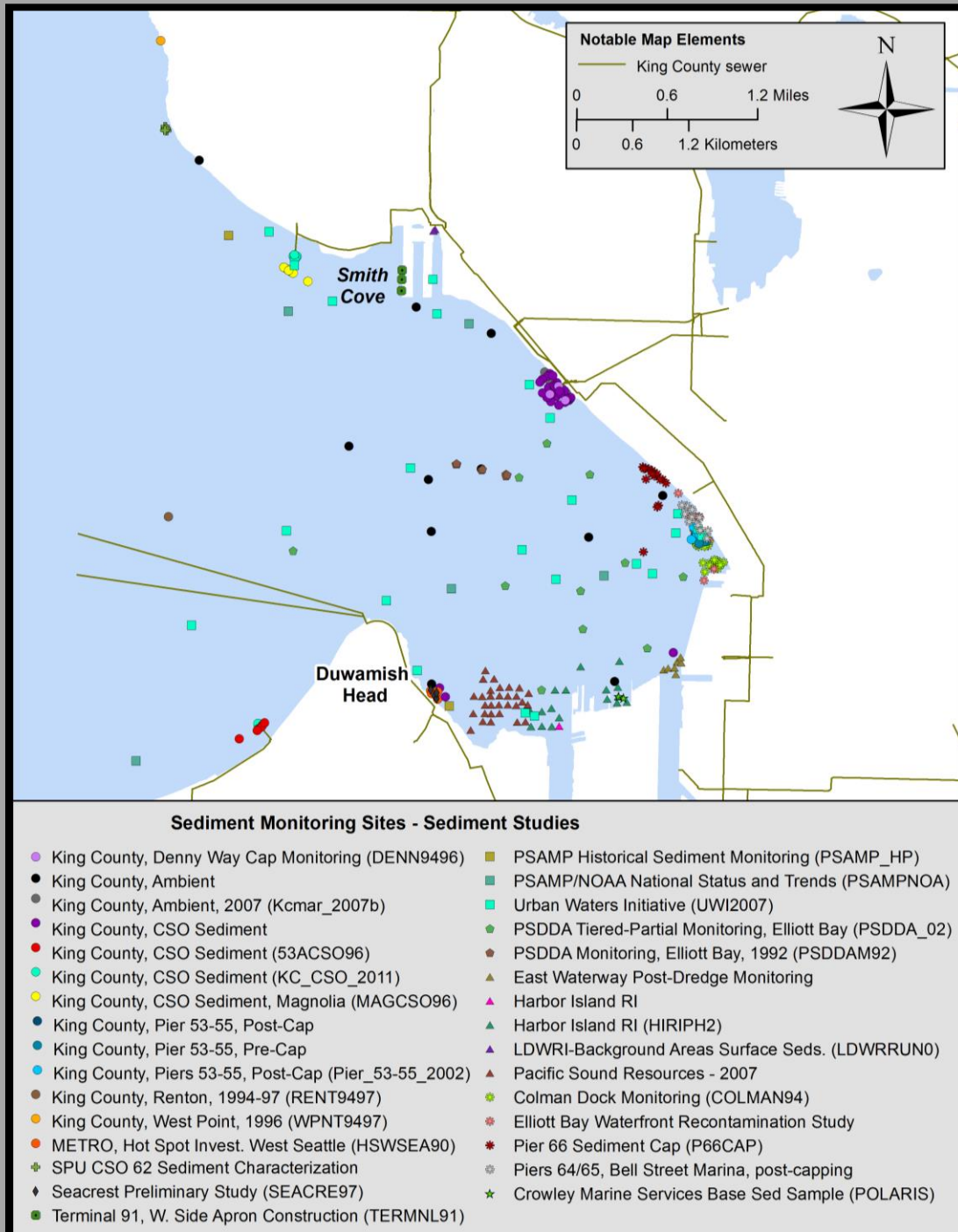
Water Quality: Bacteria



Negative (decreasing) trend at almost all sites including both beach and offshore

Sediment Quality

- 283 sites
- 1990-2013
- Various entities:
 - King County
 - WA Ecology
 - WSDOT
 - Superfund Cleanups
- Compared to sediment management standards (SMS)
- Goal: identify primary contaminants and “hot-spots”



Sediment: Primary Contaminants

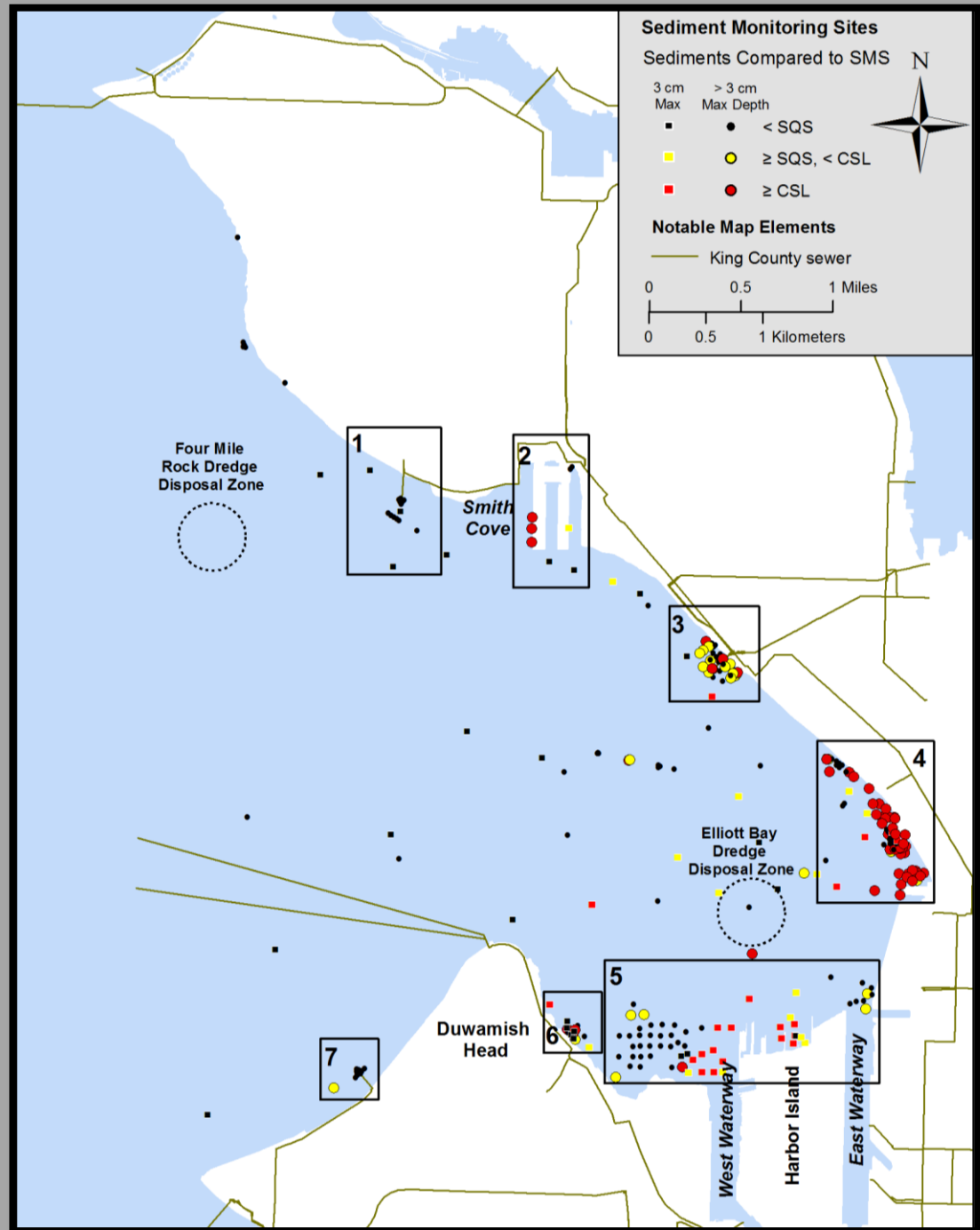
(In Order of Sediment Management Standard Exceedances)

- Greater than 10% of samples exceeded criteria:
 - Mercury
 - PAHs (most sites HPAHs > LPAHs)
 - PCBs
 - Bis(2-ethylhexyl)phthalate
- Other chemicals of concern (> 5 exceedances):
 - Dibenzofuran
 - Benzyl butyl phthalate
 - Metals (cadmium, silver, and zinc)

Sediment Quality

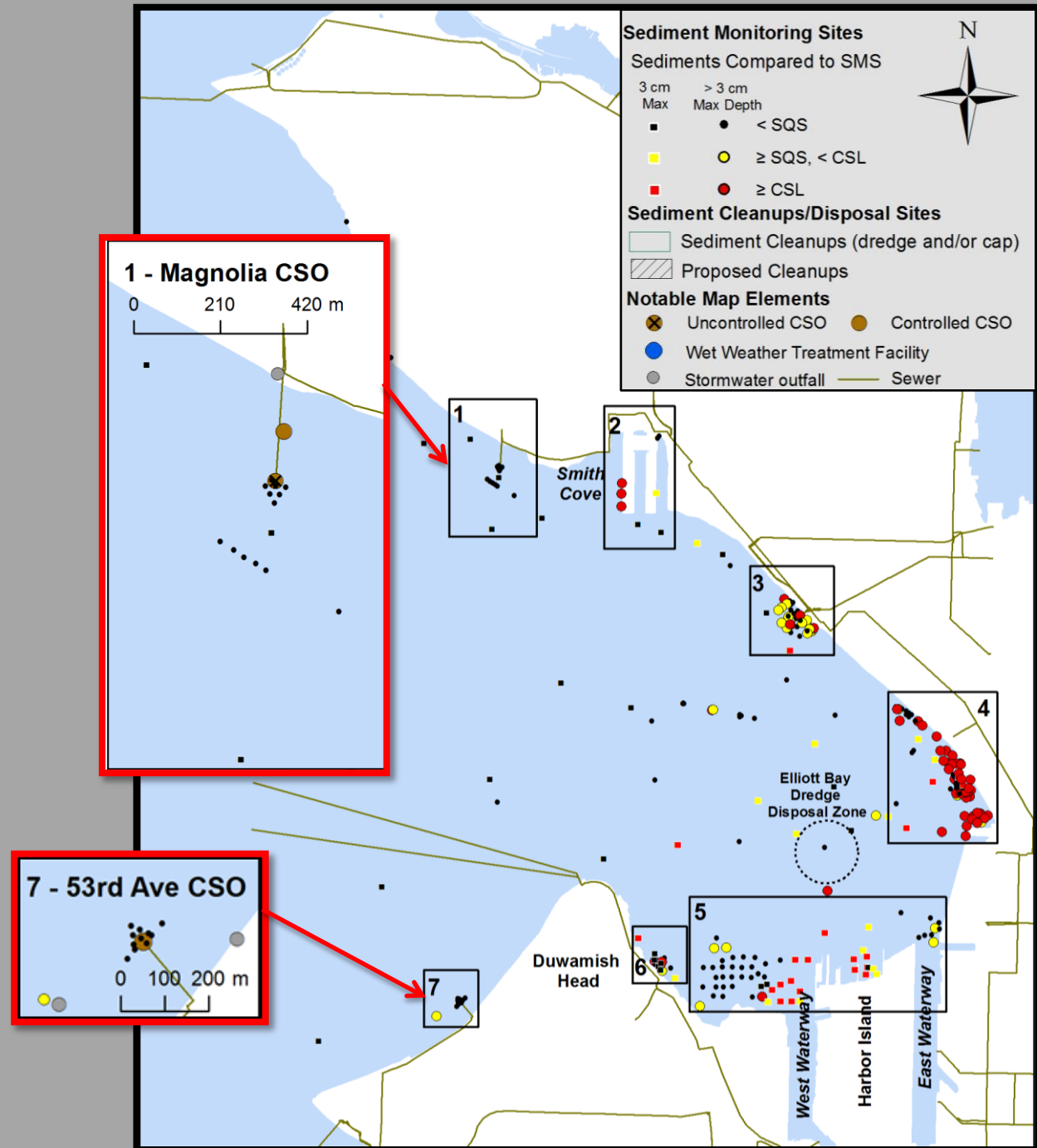
Focused on two types of areas:

- King County CSOs
- “Hot Spots”



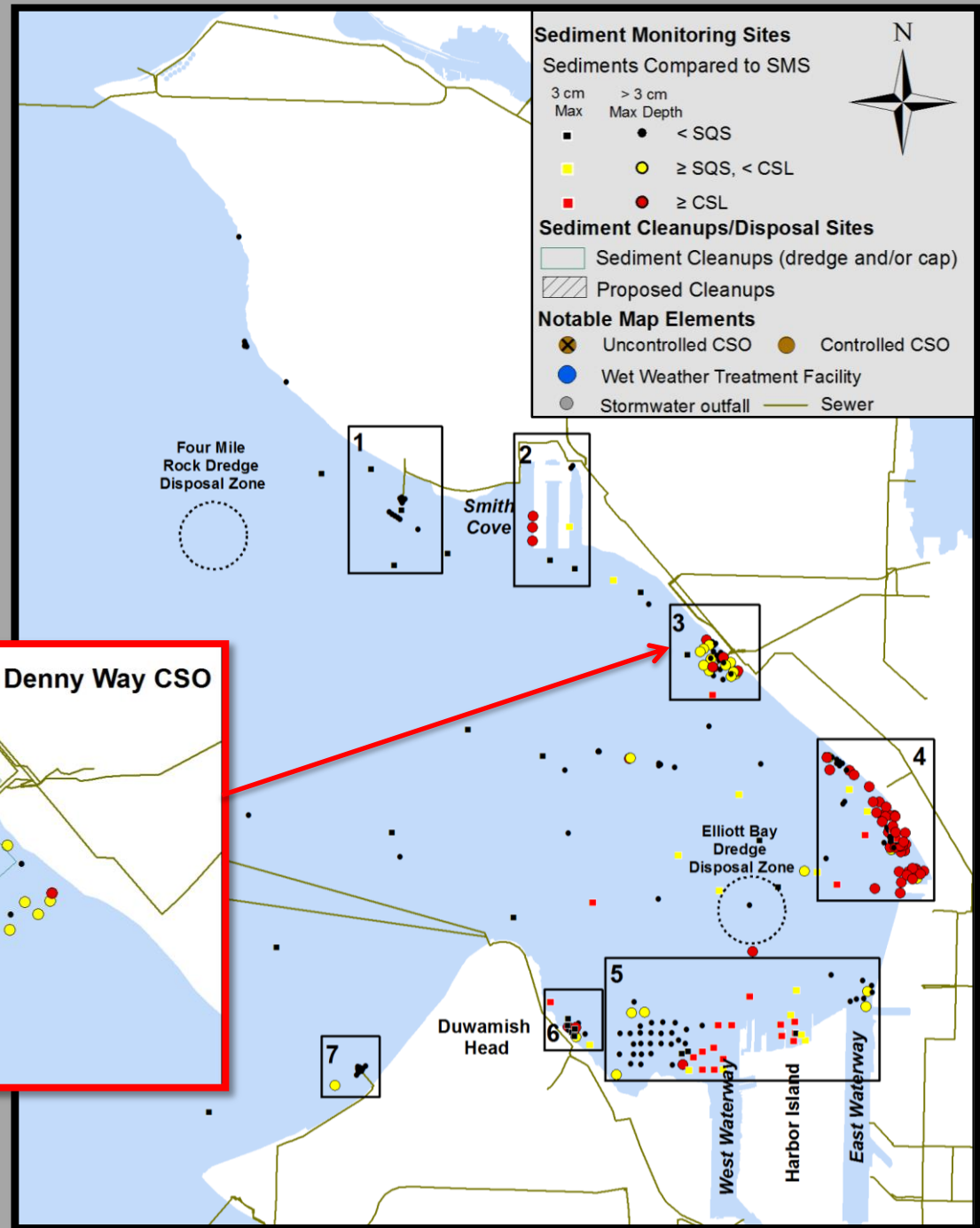
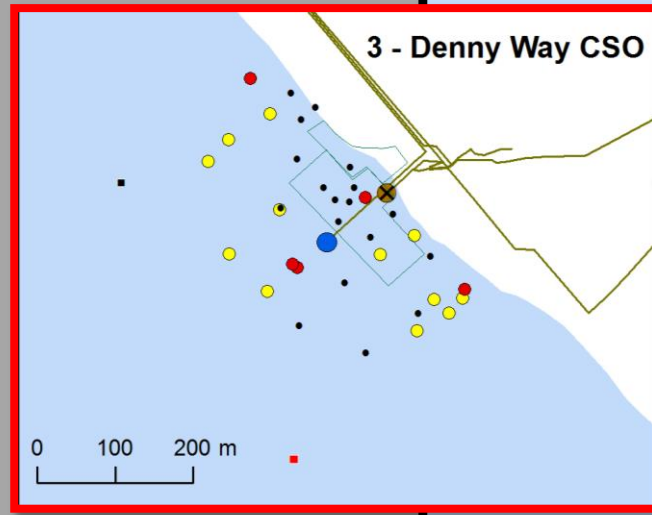
Sediment Quality

King County CSOs



Sediment Quality

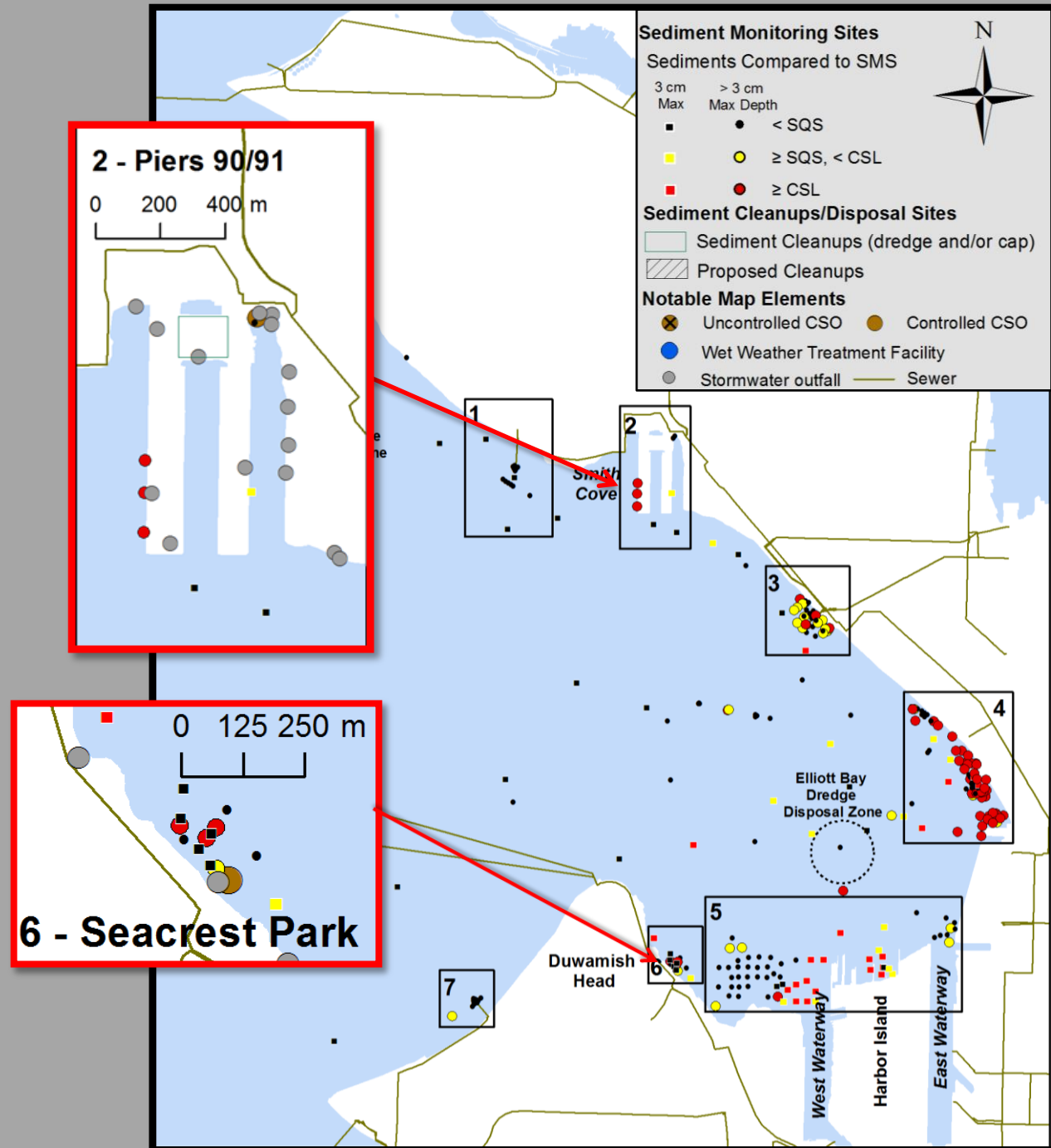
King County CSOs



Sediment Quality

“Hot Spots”

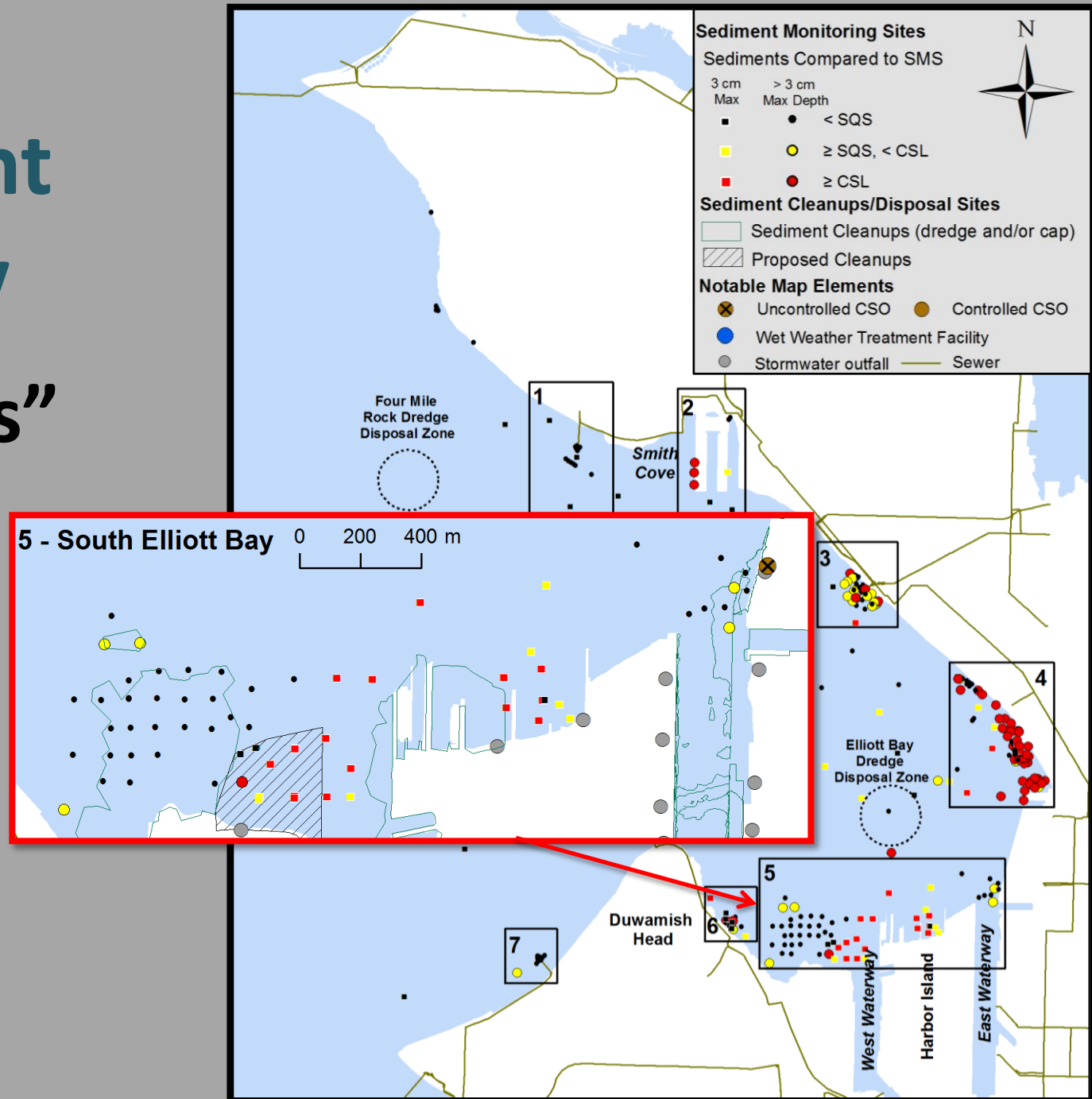
- **Piers 90/91** – some contamination near stormwater outfall (metals, PAHs, dibenzofuran).
- **Seacrest Park** – area of beach use/diving. Contamination likely due to historic pier. More recent samples do not exceed standards.



Sediment Quality

“Hot Spots”

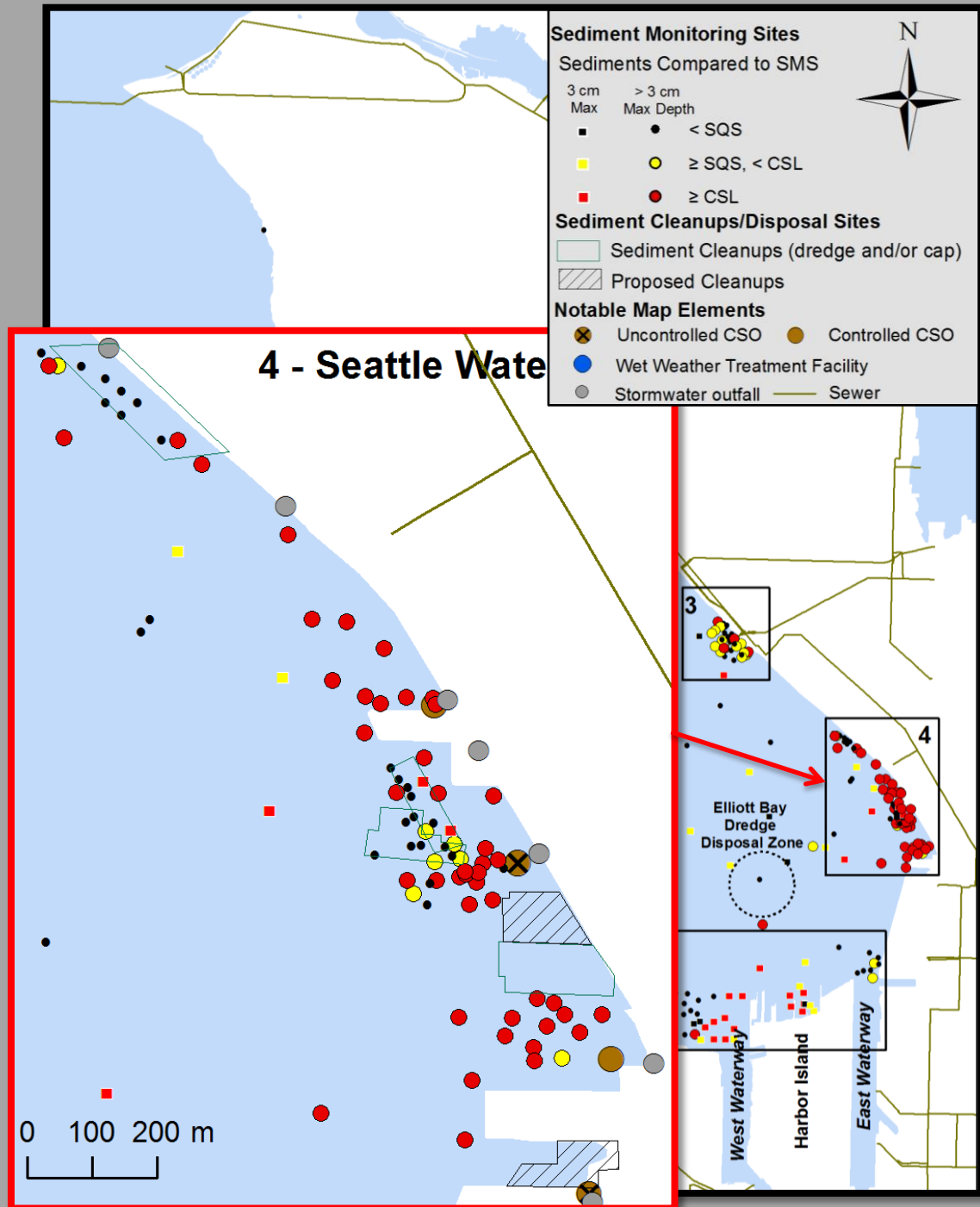
- **S Elliott Bay** – most of the area belongs to Superfund sites. Remaining contamination is concentrated where dredging has not occurred.



Sediment Quality

“Hot Spots”

- **Seattle Waterfront** – Highest concentration of contaminated sediments
 - Several cleanup efforts
 - Seattle Ferry Terminal (1989)
 - Pier 53/54 (1992)
 - Piers 64/65 (1994)
 - Exceed SMS for most chemicals: mercury (47%), HPAHs (46%), LPAHs (35%), and PCBs (31%)



Take Home Messages

- Water Quality
 - Bacteria concentrations continue to be a concern, especially at beach sites, but are declining
 - High summer surface temperature may threaten migrating salmon
 - DO may be an issue at depth and seasonally
- Sediment Quality
 - Sediment along the Seattle waterfront had greatest number of exceedances. (35 of 47 criteria contaminants > SMS)
 - Mercury, PCBs, PAHs, phthalates = problem
 - Sediments mostly appear clean where past cleanup efforts have occurred

Questions?



For more information on the Water Quality Assessment and Monitoring Study, visit:

<http://www.kingcounty.gov/services/environment/wastewater/cso/projects/water-quality-study.aspx>